

REMARKS

Claim 1 has been amended by indicating that a delta max value for cross direction shrinkage is determined by comparing a coloured article of the instant invention to a polypropylene article made in the same way but without pigment. Support for this amendment can be found in Table 1 presented in the Specification on page 17.

Claim 10 has been amended by adding steps (c) and (d). Support for these amendments can be found in the Specification in Example 2, page 15.

Claim 15 has been amended by specifying that the colouring pigment must be organic. Support for this amendment can be found in the Specification on page 5, lines 1-3.

No new matter has been added.

Rejections Under 35 USC §112, second paragraph

The Examiner has rejected claims 1-5 and 7-15 for the recitation of delta max, contending that delta max measurements require the comparison of two molded articles.

Applicants have amended the claims to indicate that the delta max is determined by comparing the cross direction shrinkage of a coloured article with an article containing no pigment, thereby overcoming the rejection.

Rejections Under 35 USC § 103

The Examiner has rejected claims 10 and 11 as obvious over US Patent No. 4,551,501 to Shiga et al. alone or in view of US Patent No. 4,670,491 to Stretanski et al and/or US Patent No: 4,192,794 to Wang et al. The Examiner contends that Shiga et al. disclose a molded article made from a polymer composition comprising a blend of crystalline polypropylene and vinyl cycloalkanes. He contends that treatment of a Ti/Et₃Al catalyst with vinyl cyclohexane results in the formation of poly(vinyl cyclohexane) containing the active catalyst. He further contends that in the subsequent step propylene is polymerized in the presence of the catalyst modified with a polymer containing vinyl units previously prepared. Lastly, he contends that the inventors contemplated the use of additives normally incorporated into polypropylene, such as pigments, however no specific amount of pigment is disclosed. He then concludes that the skilled artisan would have found it obvious to arrive at the range of colorant because this would be optimization.

The Examiner also points to the disclosure of Stretanski, which teaches polypropylene compositions containing 2.5 wt % titanium oxide, and Wang, which teaches polypropylene resin pigmented with 5 wt % titanium oxide. The Examiner concludes that one with ordinary skill in the art would have been motivated to use the same amount of coloring agent taught in these references when using the Shiga et al. invention in order to produce a colored polypropylene composition.

The Examiner acknowledges that Shiga et al. is silent with respect to the particular properties recited in the present claims, but that a reasonable basis exists to believe that the prior art compositions would exhibit the same properties since, in his opinion, they recite essentially the same composition.

The Examiner also questions whether the methodology of the experiments shown in Tables 1a and 2a of the Declaration by Mr. Bela Kona reflect a valid comparison with that of the cited reference. He states that the comparison is not valid since the masterbatch used in Shiga does not contain polypropylene, but a blend of polypropylene and polyvinyl cyclohexane is used in comparative examples 2 and 3.

Applicants respectfully traverse.

Applicants have amended all of the claims to indicate that an organic non-white or organic non-black pigment is used. Shiga et al. do not discuss organic non-black or non-white pigments. Both Stretanski et al. and Wang et al. are concerned with non-organic pigments. Neither Stretanski et al. nor Wang et al. suggest that similar amounts of organic non-black or non-white pigments can be used.

In addition, Applicants point out that the method claims now reflect that (1) the catalyst is polymerized with a vinyl compound (e.g. vinyl cyclohexane; see example 1), (2) the polyvinyl catalyst is used to polymerize the polypropylene to get the final product (an "in situ" (i.e. during the polymerization process) nucleated polypropylene; see example 2), (3) forming the final product into pellets (see example 2), (4) blending the pellets of the final product with pigment (see page 13, lines 10-12) and (5) molding an article (see Example 3). This process is not presented in either Shiga or Stretanski or Wang.

Applicants submit that the Examiner has not completely understood the experimental results presented and appears to be confused as to the teachings of

Shiga. For example, in Shiga's example 1, the catalyst is first treated by polymerizing with vinyl cyclohexane (see column 4, lines 45-62), then the polyvinyl cyclohexane catalyst is used to polymerize propylene (column 4, line 63 to column 5, line 15) to obtain a masterbatch. Thus, Shiga's masterbatch indeed contains polypropylene and corresponds exactly to the masterbatch used in comparative examples 2 and 3 in table 1a of Mr. Kona's Declaration.

Thereafter, Shiga blends 0.5 parts by weight of the masterbatch (i.e. the blend of polypropylene and polyvinyl cyclohexane) with 100 parts of pure, un-nucleated polypropylene (i.e. the "base polymer") and mixes mechanically to obtain the final product, which is a "masterbatch nucleated polypropylene blend," before molding it into an article.

As stated above, the instant invention first polymerizes the catalyst with a vinyl compound (e.g. vinyl cyclohexane), and then the polyvinyl catalyst is used to polymerize the polypropylene to get the final product (an "in situ" (i.e. during the polymerization process) nucleated polypropylene). Thus, the "base polymer" is already in a nucleated form and there is no need to blend it with a masterbatch as done in Shiga. That is, Shiga's "base polymer" is a non-nucleated "pure" polypropylene, not a nucleated polypropylene as in the instant invention. This is the first difference between Shiga and the instant invention.

The instant invention pelletizes the nucleated polypropylene final product and mixes the pellets with coloring pigments before molding to an article, this is the second difference from Shiga.

Thus, Applicants submit that the comparative experimental results submitted in the Kona Declaration are valid.

To reiterate the conclusion in the Kona Declaration, Table 1a below shows the shrinkage effect of un-pigmented polypropylene (1) which is nucleated with a master-batch in a similar way as disclosed and exemplified in Shiga et al. and (2) which is nucleated according to the present invention (i.e. in-situ during polymerization using the modified catalyst). Mr. Kona notes that while there is no significant difference in shrinkage between the tested materials in the flow direction, a marked difference in shrinkage is present in the cross direction. Here, he states, the test shows that when a non-nucleated PP material is nucleated even with a small amount of master-batch, a clear increase in shrinkage is seen (compare Reference Ex.1 with Comparative Ex. 2). Mr. Kona states that this increase is not, however, proportional to the shrinkage behavior, which increases to a much lesser extent with increasing master-batch amounts (compare Comparative Ex. 2 with Comparative Ex.3). He notes that the mechanical blending used by Shiga et al. limits the amount of master-batch (which is not described as a base resin) that can be added to 50 wt%, due to homogeneity and phase change.

Mr. Kona states that this leads to the conclusion that a higher level of shrinkage results from the nucleated homo PP of the invention, denoted in Table 1a as "Ex. 4 of the invention" and equating to "homopolymer of Example 2" described in the application. One can therefore state that the in-situ nucleation used in the present invention has a greater effect on shrinkage than does the master-batch nucleation used by Shiga et al.

As a consequence, the present invention surprisingly more effectively overcomes the influence of pigments on shrinkage than does the master-batch nucleation used by Shiga et al.

The Examiner also questions the experimental evidence presented in Table 2a and notes that the crystallization temperature increases as more nucleating agent, i.e. the polypropylene of Example 2, is added to the base resin. He concludes that these data are not unexpected and states that it is not entirely clear what is to be gleaned from the results in Table 2a.

Again, Applicants submit that the Examiner has not fully understood the meaning of the results presented. The comparison of Table 2a shows that by adding a small amount of nucleated polypropylene to a non-nucleated polypropylene the crystallization temperature (T_{cr}) increases markedly. But this increase is not proportional and never reaches the T_{cr} of the nucleated polypropylene added to the comparative examples (see comparative example versus example 8).

Similar results are presented in Example 3, Table 1 on page 17 of the Specification. Here, the cross direction shrinkage for differently coloured products made using the homopolymer of the instant invention vary little from one another – at most 0.05%. But when the same colours are used with non-nucleated polypropylene homopolymers, there is a much greater difference in shrinkage between colours – at least 0.1% and up to .36%. Similar results are obtained when talc-nucleated polypropylene homopolymers are used (i.e. a difference of 0.16% to 0.41%). These

results are unexpected and advantageous, because a single mold can be used for multiple colours. That is, because the shrinkage obtained using the instant invention is so constant and the shrinkage variability between different colours is so slight, re-tooling for each individual colour is not needed.

To summarize, a skilled artisan would not expect that shrinkage of coloured polypropylene would occur independently from the colour added when nucleated polypropylene is used as the base polymer. In addition, the prior art does not suggest that increased shrinkage and a higher crystallization temperature would result from using in-situ nucleated polypropylene (i.e. the instant invention) over mechanically nucleated polypropylene.

In view of the above remarks, all of the claims remaining in the case are submitted as defining non-obvious, patentable subject matter.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Susan Gorman (Reg. No. 47,604) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

Pursuant to 37 C.F.R, §§1.17 and 1.136(a), the Applicants respectfully petition for a two (2) month extension of time for filing a response in connection with the present application and the Commissioner is authorized to charge Deposit Account No. 02-2448 for the required fee of \$ 450.

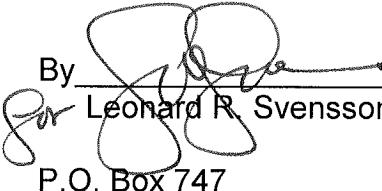
If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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